

# Missed Opportunity

Dr Martin Gill

Smart meters can be used to improve the reliability, quality and efficiency of the electricity network lowering electricity costs for all consumers. Unfortunately the AEMC Smart Meter rollout does not provide the required services meaning consumers will pay more than they should.

## AEMC Smart Meter Rollout

The Australian Energy Market Commission (AEMC) is responsible for managing the rules controlling the incredibly complex Australian National Energy Market. Recently they modified the rules requiring electricity retailers to provide smart meters to all their customers.

Smart meter rollouts are expensive. To reduce the cost the AEMC is allowing retailers to install simple meters. These simple meters are only required to support four services. The four services are:

1. Turn power on and off at consumer premises
2. Read smart meter energy data
3. Read meter status
4. Reconfigure the meter to enable new tariffs and arrangements

The majority of smart meter rollouts support significantly more services. These additional services are intended to provide network and consumer benefits. By omitting these additional services the AEMC Smart Meter rollout is a missed opportunity to improve the reliability, quality and cost of electricity for Australian consumers.

## How do smart meters benefit consumers?

Primarily the installation of smart meters benefits consumers by lowering<sup>1</sup> electricity costs for both electricity retailers and electricity distributors.

Smart meters allow retailers to operate more efficiently lowering their cost to supply electricity. AEMC rules do not pass these savings onto consumers. Instead the AEMC **assumes** retail competition will result in these savings being passed to consumers through lower electricity costs.

Smart meters also benefit electricity distributors. For distributors the AEMC sets rules ensuring savings are passed onto consumers.

## Summary of Results

Benefit analysis performed for the Victorian and National smart meter rollouts shows smart meters offer significant savings. Unfortunately because the AEMC smart meters only support four services they deliver less than half of the possible benefits.



## Identified Smart Meter Benefits and those supported by the AEMC Smart Meter Rollout (using Vict AMI Analysis)

The Victoria's Smart Meter Rollout required distributors to install meters. The total cost of the program exceeded \$2billion. The analysis shows the benefit to distributors was only \$1.5billion forcing the Victorian Government to (controversially) compensate distribution businesses for the difference.

## *When rollout costs outweigh benefits consumer electricity costs rise*

The AEMC Smart Meter rollout requires retailers to install meters. The analysis suggests the cost of the rollout will be greater than the benefit they receive. Without a mechanism to compensate retailers for the difference between costs and benefits electricity costs will rise.

Distributors are under increasing pressure to maintain the quality and reliability of electricity on their networks. The AEMC Power of Choice program aims to increase this pressure by actively encouraging consumers to participate in the energy market including the installation of solar and battery storage

<sup>1</sup> Lower costs compared to if the meters were not installed

systems. Despite understanding these systems impact the quality and reliability of electricity the AEMC chose not to include the smart meter services required to maintain Australia's existing high quality and reliable networks.

## The NEM

Australia's National Electricity Market (NEM) is by far the largest machine in Australia. A vast network of generators, transmission lines and distribution networks provides electricity to consumers in Queensland, New South Wales, Victoria, Tasmania and South Australia. The efficient management of this vast machine is a complex task.

The NEM is the largest machine in Australia



Extent of the Australian National Electricity Network

Maintaining the high reliability and quality of electricity on the NEM requires system operators to continuously monitor its operation. Measurements are made of the output of all generators and energy flow along all transmission lines. This is combined with anticipated customer loads and even weather forecasts to continuously adjust its operation.

Technology is challenging this centralised model. Increasingly large numbers of small generators are being installed throughout the NEM, for example the 1.5 million domestic solar systems produce more electricity than a major power station. While AEMC rules require all power stations to be monitored there is no similar requirement for domestic solar systems. Minor enhancements to the AEMC smart meter services could have provided distribution businesses with the information required to maintain current network reliability and quality of supply.

## Network Benefits

The majority of smart meter rollouts are undertaken by distribution businesses. For example the Victorian analysis suggested distributors receive 60% of the smart meter benefits. Another reason is because Government regulation can be used to encourage

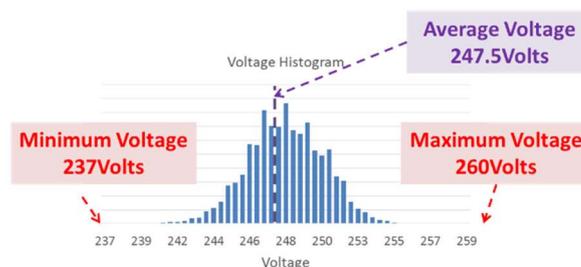
distribution businesses to pass these benefits onto consumers through lower electricity prices.

Australia currently enjoys access to a highly reliable and high quality electricity network so the following sections introduce a number of these network benefits.

## Quality of Supply - Voltage

The traditional electricity network is designed to distribute electricity flowing from large generators to consumers. As consumers increasingly install solar systems there is the potential for electricity to flow from households back to the network. These reverse energy flows increase network voltages.

Current electricity meters do not measure voltage. To give an insight into the potential issue the following shows a histogram of voltage measured by a smart meter over a full year.



Histogram of measured Voltages

The measured voltage extends from a minimum of 237Volts to a maximum of 260Volts with an average voltage of 247.5Volts. This voltage is consistently above the recommended Australian voltage of 230Volts. As noted current meters do not measure voltage so it is only by adding voltage measurement to the new smart meters that network operators can work to improve the quality of supply.

When this issue was raised with the AEMC they indicated the "read meter status" service provided this functionality. The read meter status returns a *single* measurement of the voltage. What the AEMC has failed to understand is the above histogram would require over 100,000 regularly spaced status reads per meter. To put this into perspective a local utility with 1 million customers would need to make 3,500 requests every second of everyday! The website the AEMC intends to provide to share smart meter information is not intended to handle this number of requests.

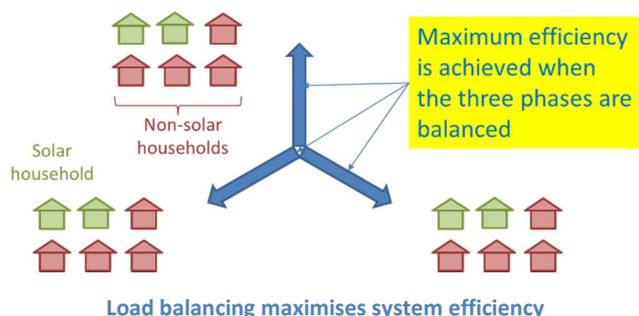
A simple low cost solution exists by allowing the smart meter to automatically record voltage measurements made on a regular basis. Once recorded the utility simply requests a day (or more) of voltage measurements rather than being forced to continuously make regular requests of a single reading.

Without this simple functionality the AEMC smart meter rollout cannot support improved quality of supply through better management of network voltage.

*Efficiency - Reverse Energy Flows*

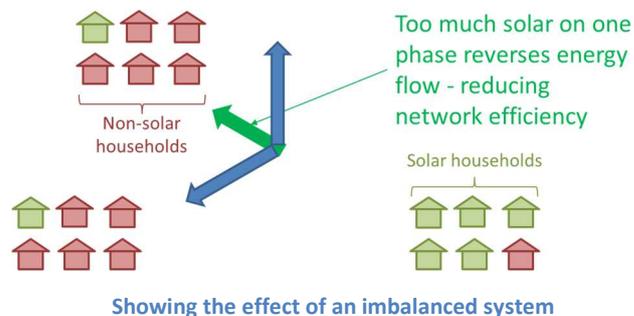
In some distribution areas 30 to 40% of households have installed a solar system. On a bright sunny day there will be reverse energy flows on the network. In addition to the voltage issues discussed above these reverse energy flows can reduce the efficiency of the network.

In Australia electricity is distributed on three phases. The efficiency of the network is maximised when the load on each of the three phases is balanced as depicted in the following figure.



The figure shows a number of households, some with and some without solar systems. The network operates efficiently when each of the three phases has (roughly) the same amount of load and solar generation.

Network efficiency decreases when there is a significant imbalance between the three phases, for example if too many solar systems are installed on one phase as depicted in the following figure.



The above figure depicts the situation where too much solar has been installed on one phase resulting in in reverse energy flow, but only on one phase. The significant imbalance between the phases results in increased energy losses through distribution transformers reducing the overall efficiency of the network.

Restoring efficient operation requires the utility to rebalance the loads/solar installations. This requires them to determine which of the three phases each house is connected to. Services supported by the AEMC smart meters cannot provide this information.

Simple analysis of the regular voltage measurements shown above demonstrated it was possible to estimate the phase each house was connected to. A straight forward calculation using energy measurements available from the AEMC smart meters can then be used to determine how best to rebalance the load and solar systems.

The AEMC smart meter rollout is being undertaken as an enabler of greater consumer participation in the energy market. What the AEMC has not considered is the need for the meters to provide services to manage the impact of greater participation in the energy market. Since the four AEMC smart meter services already require the meters to measure voltage these additional services could deliver significant network and consumer benefits at almost no additional cost.

*Reliability - Reducing the duration of outages*

The NEM is highly reliable with the vast majority of Australian consumers only experiencing an occasional loss of power. Still smart meters are able to reduce the duration of outages delivering societal benefits.

At the simplest level the smart meter is able to immediately notify the local distributor an outage has occurred. Using this information the distributor dispatches a repair crew to the area of the fault resulting in faster power restoration.

Many commercial businesses lose income during network outages through lost production, missed sales opportunities, etc. The financial benefits business customers receive from faster restoration is even greater than the benefits delivered to consumers.

Despite benefits the four AEMC smart meter services do not support improvements to network reliability. Specifically there is no requirement for retailers to contact the local distributor business when they detect an outage nor report when power is restored.

**“But the information *might* be made available”**

While the AEMC was discussing the rule changes required for their smart meter rollout they suggested retailers would choose to include additional services in their smart meters. They will do this because local distribution businesses should pay for this information.

In most distribution areas consumers can choose from more than 20 different retailers each offering potentially different smart meters to their customers. During the planning for the rollout the AEMC were asked to consider offering a common data format for all smart meters. They decided this offered no advantages. Like all the other incompatible data formats that have gone before it (VHS/Beta, DVD/Video-CD, Blu-ray/HD-DVD, etc) this results in confusion and inefficiency. Without a common format the AEMC is assuming the local distribution business will be prepared to build systems able to correctly read (up to) 20 different data formats. This significantly increases the cost to develop the software systems.

It also assumes the local distribution business can successfully negotiate individually with each retailer offering meters to customers in their area. Firstly to determine if the meters they have installed offer suitable services. Then if the meters provide suitable services they must negotiate the cost to access the data.

With increasing pressure to maintain the reliability and quality of supply on their networks distribution businesses are likely to invest in other means of obtaining the required information. The rules set by the AEMC then allow distribution businesses to pass the cost of these duplicate systems onto consumers.

This is disappointing since the AEMC could easily have avoided placing upward pressure on electricity prices by supporting additional smart meter services.

**Conclusion**

The AEMC's single minded focus on introducing competition to all aspects of the electricity network overlooks their obligation to also look after the long term interest of consumers with regard to the quality, safety, reliability and security of the electricity supply.

The AEMC smart meter rollout requires Australian electricity retailers to offer smart meters to all their customers. Analysis of smart meter benefits undertaken for other Australian smart meter rollouts (both actual and planned) found only considering retailer benefits did not recover the cost to install the meters. A review of the four services offered by the AEMC smart meter rollout suggests this remains the case. The conclusion is the AEMC smart meter rollout will place upward pressure on electricity prices.

The AEMC smart meter rollout promises to support consumer participation in the emerging energy market. Much of this market is enabled by solar systems and battery storage systems. Both of these systems have the potential to significantly impact voltages on the distribution network. Despite the potential impact the AEMC has failed to require services allowing the cost effective management of these impacts.

Distributors forced to manage the impact of these systems must invest in alternative solutions. Minor changes to the services offered by the AEMC smart meters could have largely removed the need for these alternative solutions. It is the AEMC's own rules which will be used to pass these unnecessary costs to consumers.

Whichever way you look at it the AEMC smart meter rollout is a lost opportunity to lower electricity prices for all Australian consumers.

## Citation

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## Comments or Questions?

The author is happy to receive comments or questions about this article. He can be contacted at [martin@drmartingill.com.au](mailto:martin@drmartingill.com.au)

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## About Dr Martin Gill

Dr Gill is an independent consultant specialising in the provision of advice and data analysis to the energy industry. He has provided this advice to government regulators, distributors, retailers, consumers, asset operators and equipment vendors.

Dr Gill has a broad technical background having personally developed advanced communication modems, burglar alarms, electricity meters, high voltage fault monitors and power quality analysers.

Dr Gill is a metering expert. His innovative products have been recognised with the Green Globe Award, NSW Government's Premier's Award and Best New Product by the Australian Electrical and Electronics Manufacturers Association.